

Low-Cost Options for Moderate Levels of Mercury Control

Quarterly Progress Report
Reporting Period: July 1, 2005–September 30, 2005

Principal Author:
David C. Muggli

ADA-ES, Inc.
8100 SouthPark Way, Unit B
Littleton, Colorado 80120

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EXECUTIVE SUMMARY

The U.S. Department of Energy (DOE) Cooperative Agreement number DE-FC26-05NT42307 “Low-Cost Options for Moderate Levels of Mercury Control,” covers an award for funding a project that will investigate and test the Electric Power Research Institute’s (EPRI) patented TOXECON II™ process on two cold-side precipitator-equipped plants, and investigate and test the use of high-temperature sorbents on two hot-side precipitator-equipped plants. The DOE made this award through the National Energy Technology Laboratory (NETL) on February 17, 2005.

Testing will be conducted at four different sites: TOXECON II™ at two sites and high-temperature reagents/sorbents at two sites. A summary of the test configurations is shown in Table 1.

Table 1. Host Site NETL Area of Interest.

Area of Interest	AEP Gavin (tentative)	Entergy Independence	MidAmerican Council Bluffs	MidAmerican Louisa
Technology	TOXECON II™		High-Temperature Reagents/Sorbents	
Low-rank fuels		X	X	X
Bituminous fuels	X			
Test size (MW)	200	105	88	350
Longer-term tests (1–2 months)	X	X	*	*

** The project will test dry sorbents at Council Bluffs and liquid reagents at Louisa. The project will perform long-term testing at only one site based on the parametric testing results.*

This report covers the project activities for the third quarter of 2005 from July 1, 2005, to September 30, 2005.

During this period, ADA-ES and the host site completed the test equipment installation and baseline testing and began parametric testing at Entergy’s Independence Station. These efforts included moving the PAC injection silo onto the site and erecting it on the foundation, arranging for and installing on site a PortaPAC™ bulk-sack injection system for use during parametric testing, installing the mercury analyzers and the particulate monitors, and completing the tie-in with plant systems for power and data.

ADA-ES signed the Host Site agreement with Entergy and completed the overall project funding arrangement with EPRI. Baseline tests at Entergy’s Independence Station started on August 16, 2005, but terminated on August 26, 2005, due to operating problems on the test fields of the ESP unrelated to the testing. Field-testing resumed on September 28, 2005.

Due to the delay encountered with the Independence testing, the MidAmerican Louisa Station test has been rescheduled to follow the completion of the Independence testing.

Because of equipment and manpower availability, the high-temperature sorbents testing for MidAmerican Council Bluffs Unit 2 is now slated for late spring or early summer 2006.

RESULTS OF WORK

Approach

This period covers the second full quarter of project activities, primarily the preparations and beginning of the testing work for the TOXECON II™ testing at Entergy's Independence Station, the first testing efforts for this project.

Results and Discussion

Project General

ADA-ES executed a participation agreement with Xcel Energy for providing three used BHA CPM 5000 particulate monitors to ADA-ES. As expected, these units required some refurbishment and are now operating properly.

ADA-ES has a signed agreement with EPRI for the cost share on this project.

TOXECON II™ Description

The TOXECON II™ technology injects reagents and/or sorbents directly into the downstream collecting field(s) of an ESP. Since the ESP collects the majority of the fly ash in the upstream collecting fields, only a small portion of the total collected ash contains reagents/sorbents. The TOXECON II™ technology requires minimal capital investment compared to other alternatives because it requires only minor retrofits to the ESP for the carbon injection system instead of installing a separate secondary particulate control device.

In this process, the sorbent injection lances are located within the ESP box, injecting sorbent across the front face of a downstream field. A normal sorbent storage silo and feeder system provides the sorbent to the injection grid. The location of the injection grid is dependent on the ESP SCA, the number of fields in the ESP, and the physical size of the fields.

Since the sorbent/ash mixture from the latter fields is primarily sorbent, this process also allows for the possibility of recycling the partially spent sorbent back into the process to achieve greater sorbent utilization.

Figure 1 shows the general configuration and the typical sampling for the TOXECON II™ process.

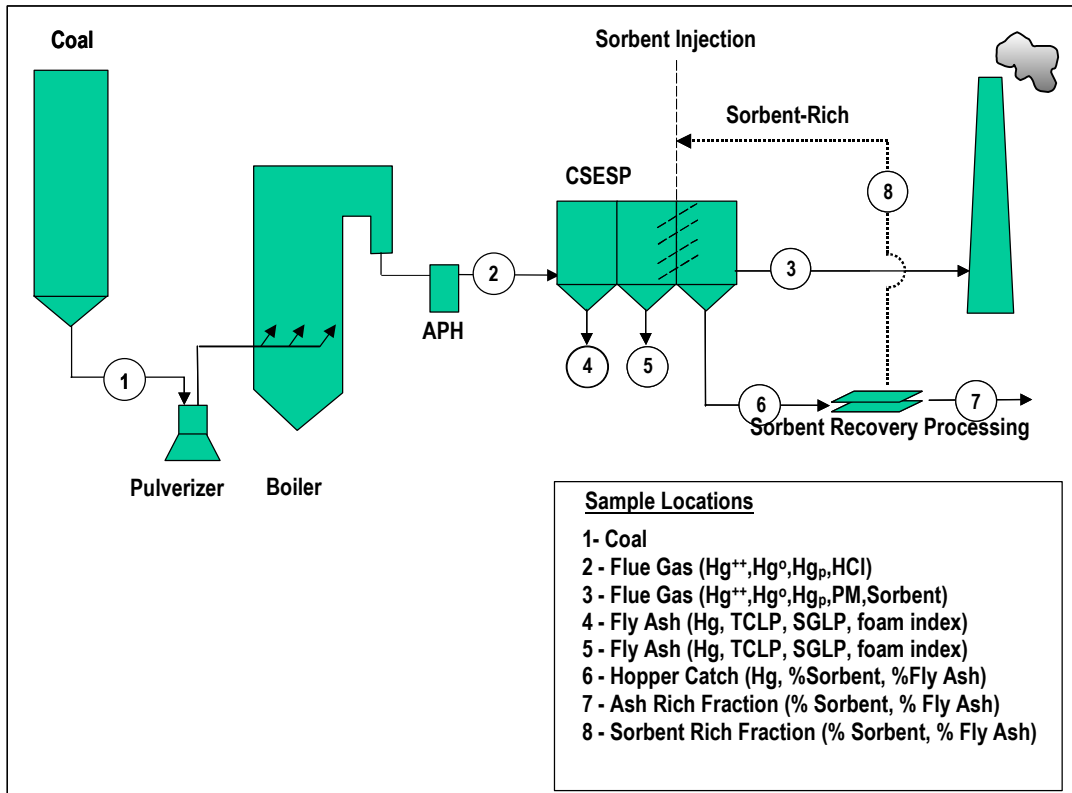


Figure 1. General Configuration and Sampling in TOXECON II™ Tests.

Entergy Independence Station – TOXECON II™

Site Description

The Entergy Independence Steam Electric Station consists of two 840-MW PRB coal-fired electric generating units. Testing for this Project is on Unit 2.

These units are balanced draft Combustion Engineering tangentially fired divided furnace boilers, Ljungström regenerative air heaters, and CE Walther rigid frame cold-side electrostatic precipitators. The ESP for each generating unit has four boxes in a two-wide by two-high stacked arrangement, with each box consisting of eight transformer/rectifier (T/R) sets, sixteen physical fields arranged in a four-wide by four-deep configuration, and with each T/R set powering two physical fields. The gross SCA at design flow is 540 square feet per 1,000 ACFM.

The inlet and outlet ducts for each box are split into two separate ducts, making it convenient to have a test portion and a control portion in the same ESP box. Sorbent injection testing will take place on one-half of one box, or one-eighth of the total flue gas flow.

This project will install specially designed injection grids for this test between the second and third fields and between the third and fourth fields. This allows collecting the injected sorbent at either an effective SCA of 270 (two fields) or of 135 $ft^2/kacfm$ (one field).

The carbon injection system for the parametric tests consists of a portable feeder-blower unit that feeds the sorbent from 900-lb capacity bulk-storage bags. With the normal parametric

testing injection ranges, this configuration allows testing a single sorbent for approximately 8 hours using a single bulk-storage bag. The feeder on this unit is a variable speed screw feeder that allows testing at various injection rates.

The carbon injection system for the long-term tests consists of a storage silo with an approximately 40-ton storage capacity. Sorbent feeds from the silo into two feeder trains that mix the sorbent with transport air and convey it to the injection grid connections at the top of the test ESP box, into the injection grids, and into the gas stream inside the ESP. The transport air quantity is constant, but a variable speed screw feeder meters the sorbent into the transport air through an eductor. This allows testing at various sorbent injection rates.

The plant ash handling system is a dilute-phase pressure system with pressure feeders at each ESP hopper outlet and two storage silos, normally one for each generating unit. With minor modifications to the transport system, the ash/carbon mixture from the four hoppers under the test fields is segregated and transported to a dedicated silo.

For collection of plant operating data, the test site has a workstation connected to the plant control and information system that makes the necessary plant data immediately available to the testing efforts.

Figures 2 and 3 show the carbon injection system and the injection grids for the test installation at Independence.



Figure 2. Long-Term Test Injection Silo.



Figure 3. Injection Grid between ESP Fields.

The parametric testing at Independence will evaluate four powdered activated carbon sorbents: DARCO® Hg, DARCO® Hg-LH, and two experimental DARCO® sorbents, DARCO® E-10 and DARCO® E-11. Based on the results from the parametric tests, the project will select one sorbent to use during the long-term tests.

The project will measure the mercury levels in the gas streams using semi-continuous emission monitoring, Ontario Hydro method duct traverses, and sorbent trap method samples. It will measure particulate emissions using two BHA CPM 5000 particulate monitors (one across the ESP outlet duct on the test half and the other across the ESP outlet duct on the control half), a TEOM particulate monitor in the ESP outlet duct on the test half, EPA Method 5 or Method 17 duct traverses, and data collection from the Unit 2 plant opacity monitoring system.

Field Testing

Installation

During this quarter, ADA-ES executed a contract with Banner Industrial Contractors to move the injection silo and injection skid from the Georgia Power Plant Yates to the Independence site and erect the silo and skid on the foundation at the site. Banner completed this effort on July 16, 2005.

Entergy, through a contractor, installed four ports at the outlet of the ESP for the particulate monitors, cleaned the existing test ports at both the inlet and outlet, and installed the necessary scaffolding for access to the existing test ports on the inlet and outlet ESP ducts and for the CPMs. They also constructed an analyzer enclosure on the grating at the top of the ESP.

ADA-ES installed two mercury SCEMs, one for the inlet and one for the outlet of ESP “B.” They will measure the mercury concentrations at three locations: the test-side inlet duct, the test-side outlet duct, and the control-side outlet duct. Each of these locations includes an extraction probe and the necessary sample conditioning train.

GE leasing delivered and set up the ADA-ES site office trailer located under the ESP.

ADA-ES issued the final test plan on July 29, 2005.

ADA-ES contracted with Metco Environmental, an environmental testing contractor, to perform the Ontario Hydro tests, the EPA Methods 5 and 17 particulate tests, and Method 26a tests for the testing effort.

ADA-ES prepared and issued the Sample Data Management Plan for comments.

ADA-ES installed a Thermo TEOM 7000 particulate monitor in one of the ports on the test side of the ESP. This device is a single point continuous particulate monitoring device that extracts an isokinetic flue gas sample, collects the particulates, and measures the change in collected sample weight over time to give a continuous particulate loading indication.

ADA-ES completed fabrication of the alignment devices for the continuous particulate monitors, requested and received the focusing adapters from BHA, and installed the monitors

on site. One monitor measures particulates across the test half of the ESP and another monitor measures the particulates across the control half of the ESP. With this arrangement, we can monitor the particulates in the treated half as well as an untreated half.

Baseline Tests

August 15–August 21

September 28–September 30

Baseline testing at Independence began on August 15, 2005. On August 16, Entergy informed ADA-ES that the last field on the test half of the ESP had experienced an operating problem that would not be fixed until mid-September. The project team decided to have Metco complete the Ontario Hydro and other manual measurements and to conduct an abbreviated, one-week parametric test to gather preliminary results, then halt the testing.

Plant operations repaired the ESP field problem on September 17, 2005. During the outage, ADA-ES inspected the injection grids, which showed no apparent carbon buildup in the ESP nor plugging of the injection nozzles in the grids.

ADA-ES submitted a revised test plan based on starting the continuation of the tests on September 28.

The continuation of the testing began on September 28, 2005, with a repeat of three days of baseline testing. Parametric testing will follow these tests immediately on October 1, 2005.

Parametric Tests

August 22–August 25

September 8–September 9

ADA-ES conducted a shortened parametric test sequence injecting DARCO[®] Hg, DARCO[®] Hg-LH, DARCO[®] E-10 and DARCO[®] E-11 during the week of August 22 and halted the testing on August 25, 2005.

After reviewing the data from the abbreviated parametric tests, ADA-ES noticed some particulate spikes when injecting the DARCO[®] Hg and to a lesser extent when injecting DARCO[®] Hg-LH. To verify that this was a true operating trend, ADA-ES conducted two additional days of parametric testing injecting DARCO[®] Hg and DARCO[®] Hg-LH on September 8 and 9. These data combined with the earlier data indicated that the particulate spiking was related to the ESP rapping cycles. These observations will be further investigated during the subsequent testing.

During the abbreviated parametric testing, there was a very good correlation among the readings from the plant stack opacity monitor, the BHA CPM 5000 particulate monitors, and the TEOM 7000 monitor.

Long-Term Tests

Because of the delay in parametric tests and the desire to complete the long-term tests by mid-November, the schedule was modified leaving no time between the parametric and long-term tests. However, it was necessary to place an order for the truckload of carbon for the

long-term tests. Based on the slightly better removal rates for the DARCO[®] Hg-LH, minimal opacity spiking during ESP plate rapping, and discussions with other project participants, DARCO[®] Hg-LH was chosen for the long-term tests.

MidAmerican Louisa – High-Temperature Sorbents

MidAmerican's Louisa station is a test site for high-temperature sorbents. This plant has a hot-side ESP and uses a proprietary liquid reagent, ADA-37, for flue gas conditioning for ESP performance. The Project testing at this site will be a two-week test for baseline and parametric testing only on liquid sorbents, using the existing flue gas conditioning equipment for sorbent injection.

During this reporting period, ADA-ES began investigating the reagents for the baseline and parametric testing, and started efforts on a draft of the test plan.

MidAmerican Council Bluffs Unit 2 – High-Temperature Sorbents

MidAmerican's Council Bluffs Unit 2 is a test site for high-temperature sorbents. This plant has a hot-side ESP with no flue gas conditioning. The Project testing at this site will be a typical test effort with baseline, parametric, and long-term tests. Since carbon-based sorbents do not perform well at elevated temperatures, the sorbents or reagents for this testing will be non-carbon-based sorbents or reagents, requiring the installation of a dry injection system.

During this reporting period, ADA-ES had discussions with CDEM who has tested a dry furnace injected chemical additive on a small unit and has seen promising results.

AEP Gavin Station – TOXECON II[™]

In the original Project proposal, AEP's Gavin Station was a possible site for TOXECON II[™] testing in 2007. After further investigation, AEP has questioned the applicability of this site for a TOXECON II[™] test due to the site configuration and operational characteristics. The Project is investigating other possible AEP sites for this testing.

Conclusion

Overall, the Project is progressing generally on schedule with no known concerns.

MILESTONES NOT MET

None.

COST AND SCHEDULE STATUS

See form SF-269A included in the appendix. Also included in the appendix is a project schedule.

SUMMARY OF SIGNIFICANT ACCOMPLISHMENTS

1. At Independence, using contractors for some parts of the work, Entergy and ADA-ES installed the injection silo and skid, the test-port access platforms, the mercury monitors, and the particulate monitors.
2. ADA-ES prepared and submitted the test plan for the Independence testing.
3. ADA-ES began the Independence testing but was interrupted due to unrelated ESP operational problems. Mercury removal levels appear to be in the expected range.
4. ADA-ES signed the agreement with EPRI for cost share on this project.

ACTUAL OR ANTICIPATED PROBLEMS OR DELAYS

Due to the unrelated ESP problems, testing at Independence was interrupted for about a month while Entergy made the necessary repairs. This will push out the anticipated start of the testing at MidAmerican Louisa.

The particulate data indicate a correlation between ESP plate rapping and spikes in particulates at the ESP outlet, as well as an increase in opacity at the stack. We believe we can control this by changing the rapping programming.

DESCRIPTION OF TECHNOLOGY TRANSFER ACTIVITIES

ADA-ES prepared and submitted a paper for presentation at the POWER-GEN International 2005 conference in Las Vegas in December 2005.

ADA-ES made a presentation on the project during the Subbituminous Energy Coalition meeting in Denver on September 7, 2005.

ADA-ES submitted an abstract to the ELECTRIC POWER 2006 Conference that will be held in Atlanta in May 2006.

APPENDIX

FINANCIAL STATUS REPORT

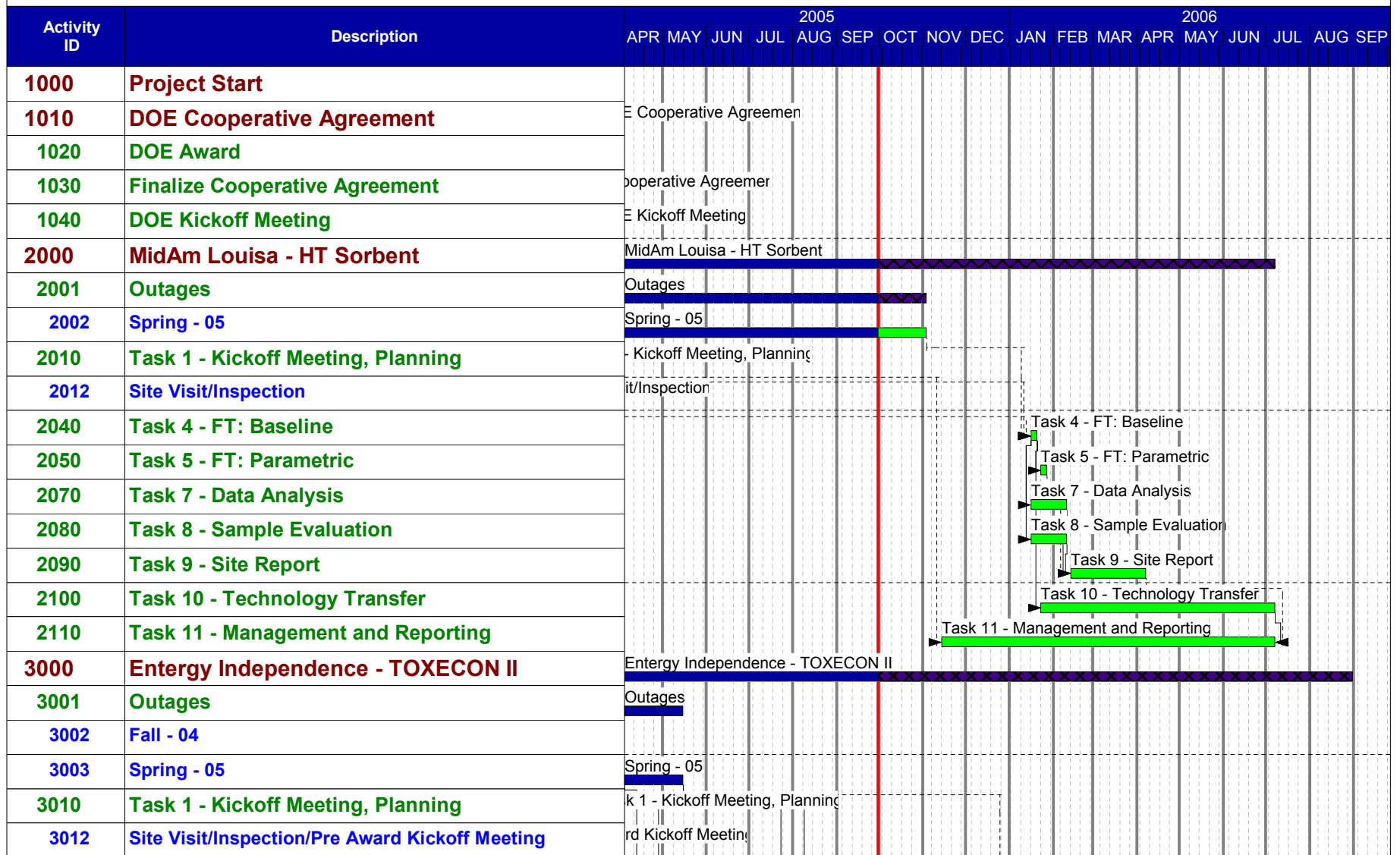
(Short Form)

(Follow instructions on the back)

1. Federal Agency and Organizational Element to Which Report is Submitted DOE/NETL		2. Federal Grant or Other Identifying Number Assigned By Federal Agency DE-FC26-05NT42307		OMB Approval No. 0348-0039	Page of 2 1 pages
3. Recipient Organization (Name and complete address, including ZIP code) ADA-ES, Inc. 8100 SouthPark Way Unit B Littleton, CO 80120					
4. Employer Identification Number 84-1341182		5. Recipient Account Number or Identifying Number		6. Final Report <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	7. Basis <input type="checkbox"/> Cash <input checked="" type="checkbox"/> Accrual
8. Funding/Grant Period (See Instructions) From: (Month, Day, Year) 02/10/2005		To: (Month, Day, Year) 02/09/2008		9. Period Covered by this Report From: (Month, Day, Year) 07/01/2005	To: (Month, Day, Year) 09/30/2005
10. Transactions:		I Previously Reported	II This Period	III Cumulative	
a. Total outlays		156,090.83	500,001.86	656,092.69	
b. Recipient share of outlays		43,081.07	138,000.51	181,081.58	
c. Federal share of outlays		113,009.76	362,001.35	475,011.11	
d. Total unliquidated obligations				0.00	
e. Recipient share of unliquidated obligations				0.00	
f. Federal share of unliquidated obligations				0.00	
g. Total Federal share (Sum of lines c and f)				475,011.11	
h. Total Federal funds authorized for this funding period				3,946,323.00	
i. Unobligated balance of Federal funds (Line h minus line g)				3,471,311.89	
11. Indirect Expense	a. Type of Rate (Place "X" in appropriate box) <input checked="" type="checkbox"/> Provisional <input type="checkbox"/> Predetermined <input type="checkbox"/> Final <input type="checkbox"/> Fixed				
	b. Rate see attached	c. Base \$256,213.88	d. Total Amount \$241,591.98	e. Federal Share \$105,787.47	
12. Remarks: Attach any explanations deemed necessary or information required by Federal sponsoring agency in compliance with governing legislation.					
13. Certification: I certify to the best of my knowledge and belief that this report is correct and complete and that all outlays and unliquidated obligations are for the purposes set forth in the award documents.					
Typed or Printed Name and Title Richard Schlager, Vice President			Telephone (Area code, number and extension) (303) 734-1727		
Signature of Authorized Certifying Official			Date Report Submitted		

Project Schedule

Project Manager - Dave Muggli



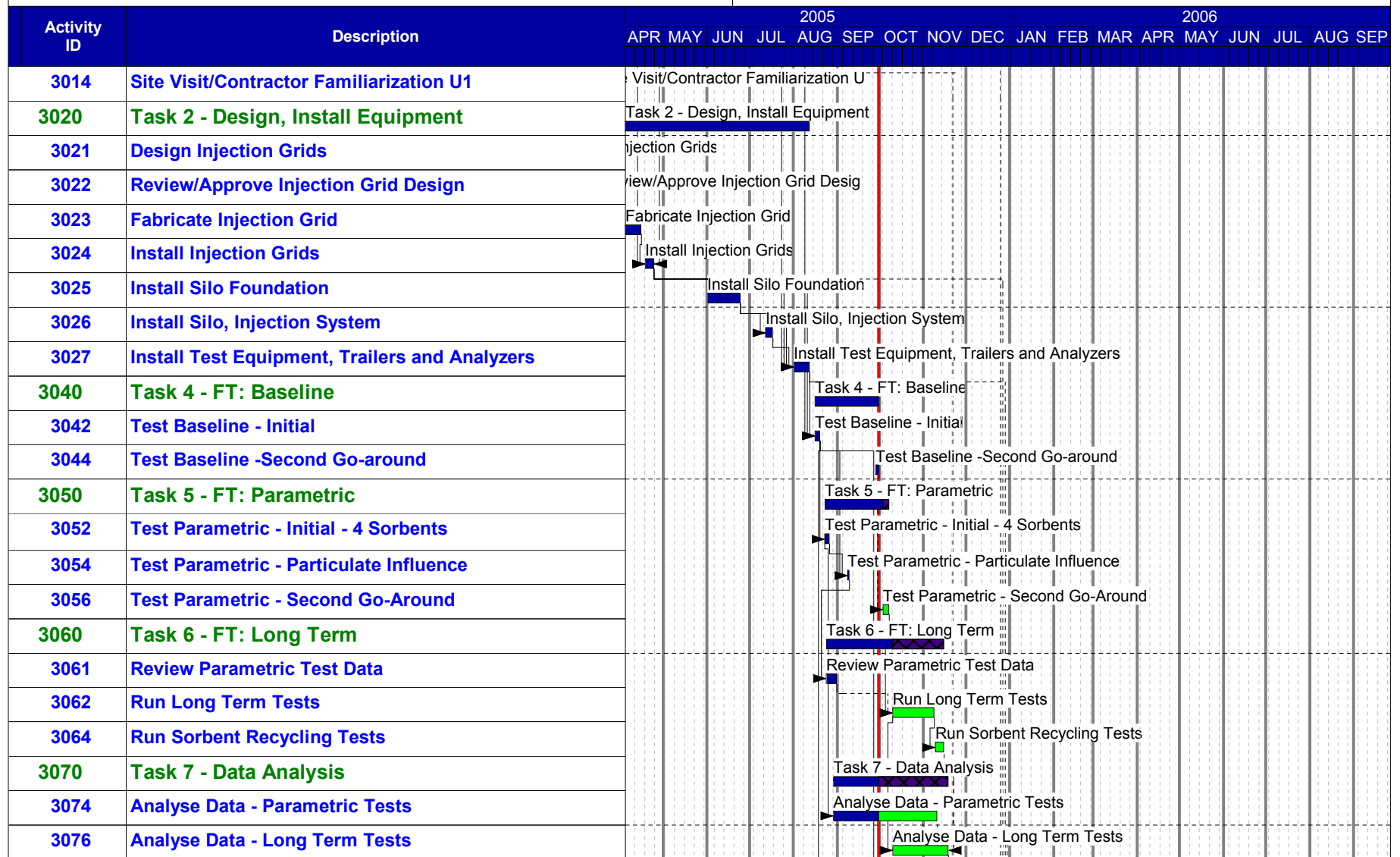
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 Summary bar
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 Finish milestone point

Project Schedule

Project Manager - Dave Muggli



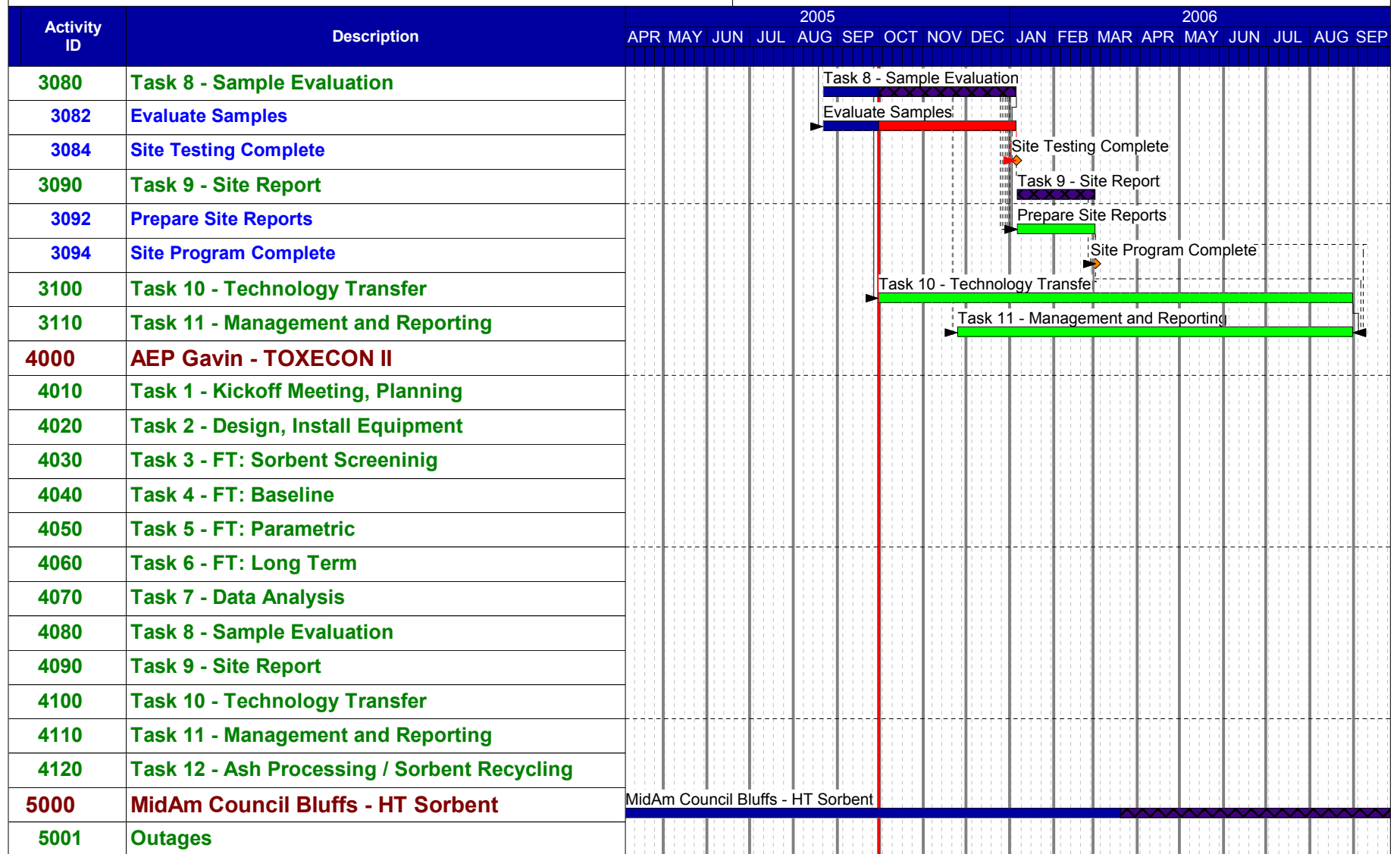
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Project Schedule

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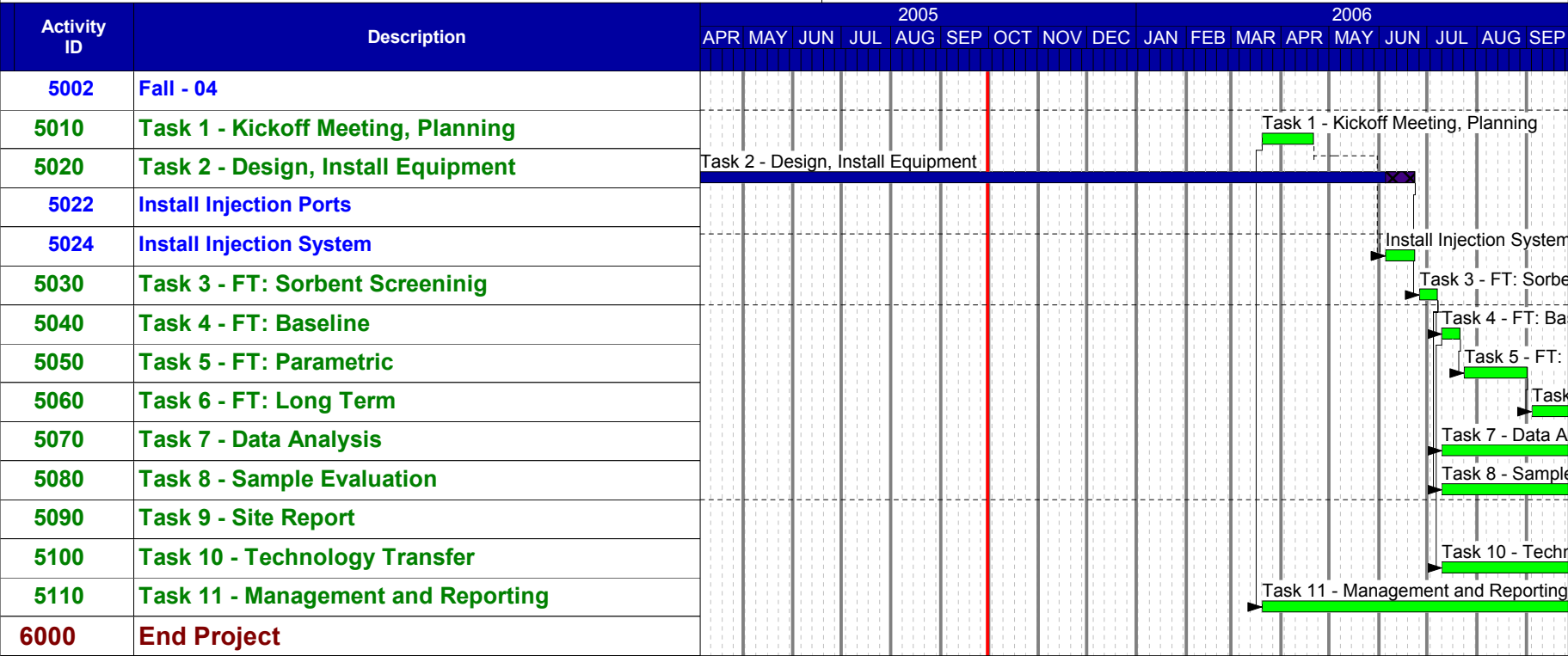
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Project Schedule

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